

IAMOT 2018

ASSESSING INNOVATION CAPABILITIES OF WINE INDUSTRY SMEs IN THE REGION OF
SAN JUAN-ARGENTINA

Lucia Desgens^{1,2}, Sandra Oviedo², Daniel Galvez³, Mauricio Camargo^{1*}

(1) Laboratoire ERPI- Université de Lorraine
8 rue Bastien Lepage, 54010(France), Mauricio.camargo@univ-lorraine.fr

(2) Dirección de Proyectos Tecnológicos en Maestría en Informática Universidad Nacional de San Juan, Av.
Libertador Gral. San Martín 1109, J5400ARL San Juan, Argentina; luchidesgens@gmail.com;
sandra.oviedo1@gmail.com

(3) Departamento de Ingeniería Industrial, Universidad de Santiago de Chile. Av. Ecuador 3769, Santiago (Chile).
Daniel.galvez@usach.cl

ABSTRACT

Managing innovation capabilities has been broadly documented in the scientific literature, as one of the main potential leverages to enable firms, in an efficient manner, undertaking innovation-oriented actions to be competitive. Several innovation assessment methodologies have been proposed and implemented. In the present paper, we argue that the contextualization of such assessment is necessary to better conduct an innovation survey aiming to support innovation management processes; at the firm level but also within a sector. As an example, wine industry is one of the traditional sectors where innovation is deeply changing the market and supply chain dynamics, challenging current actors but opening opportunities for SMEs. After proposing an innovation assessment contextualization approach, it has been applied to a set of firms of the wine sector of the San Juan region in Argentina. Then, the obtained results are presented and implications and perspectives outlined.

1. INTRODUCTION

Managing innovation capabilities has been broadly documented in the scientific literature, as one of the main potential leverages to enable firms, in an efficient manner, undertaking innovation-oriented actions to be competitive. Several assessment methodologies have been proposed and implemented, for firm individual purposes, but also at the regional and collective level for industrial policy making. (Boly et al., 2014; Chiesa et al., 1996; Guan et al., 2006; Wang et al., 2008; Yam et al., 2004). However, although those methodologies claim to be generic, because the main practices of the innovative companies are well known and documented, from our point of view, innovation capabilities of firms are to some extent, a context-depend phenomenon. It implies that to be applied an innovation assessment methodology must be “contextualized” in order to better fit to the conditions of a local/sectorial context. As a consequence, this paper’s aim is to propose a methodological approach enabling the contextual adaptation of an innovation assessment approach.

The need to adapt the innovation capability assessment to the company context is verified by seeing that although the proposed assessment models coincide in the main practices, they differ in some specific practices, precisely those that have a higher degree of dependence to cultural, industrial and economic context of the company. One of the assessment model that has studied this difference of contexts is the PII potential Innovation Index, proposed by the ERPI research team at the University of Lorraine (Boly et al., 2014, 2000; Rejeb et al., 2008). The PII proposes a framework based on a set of innovation management practices. Each practice is then, subdivided into multiple criteria; which are directly linked to phenomena or facts observed in the day-to-day firm routines of functioning. These practices are then, evaluated through a maturity grid to establish the performance degree of the firm regarding the evaluated phenomenon. To finish, a multi-criteria based approach is adopted to aggregate the evaluations into a PII index (Nemery et al., 2012), to set the firm profile based on a typology off four groups of innovative firms (*proactive*, *preactive*, *reactive*, *passive*). This methodology has been already used in different contexts. Sepulveda et al., (2010) applied the PII index to evaluate the innovation capabilities of manufacturing SME’s In Chile. In other (Galvez et al., 2013), proposed an international benchmarking of innovation practices between SME’s of Argentina and France). The results of these studies show that companies present different profiles of performance in innovation practices

according to the context country. Haddad et al, (2014) proposed the adaptation of the PII to the context by varying the weights vector that determines the importance of each practice for PII calculation, without modifying the practices or observable phenomena associated. In this paper we propose another adaptation strategy of the PII analyzing modifications in the way of defining the practices, observable phenomena and maturity grids that make up the PII.

Wine industry is one of the traditional sectors where innovation is deeply changing the market and supply chain dynamics, challenging current actors but opening opportunities for SMEs (Garcia et al., 2012). After proposing an innovation assessment contextualization approach, it has been applied to a set of firms of the wine sector of the San Juan region in Argentina. Then, obtained results are presented and implications and future perspectives outlined.

So in this particular case we decide to apply the approach by taking into account the local context: Argentinian national and local innovation support policy, direct interviews with entrepreneurs, and local and sectorial dedicated language. Evaluation of the assessed firms are described individually and analyzed. To finish, obtained results shown that although the approach remains relevant to realize an international benchmarking, an adapted approach improves the entrepreneurs' receptivity of the proposed results but also a potential integration of the aggregated results by the local policy makers.

2. OVERVIEW OF THE INNOVATION CAPABILITY ASSESSMENT AND REGIONAL CONTEXT

2.1 Innovation Capability Assessment

The innovation capabilities in companies has positioned itself as an activity capable of generating value and granting competitive advantages in the industry. Therefore, many researchers and entrepreneurs are interested in proposing support tools to manage these capabilities in companies. One of the great challenges for configuring these tools is to define a method or model for assessing innovation capabilities. However, it is not an easy job, according to a study by the Boston Consulting Group, only 35% of entrepreneurs are satisfied with the indicators to measure their innovation performance and 74% prefer a more rigorous assessment model (James et al., 2008).

Thus, research to determine valid innovation indicators have increased in recent years, showing a clear trend towards the measurement of internal practices that enhance innovation in companies. Milbergs and Vonortas (2004) studied changes in innovation indicators over time by identifying 4 generations of metrics, ranging from an evaluation based on inputs and outputs (black box) to internal process evaluation. This fourth generation has developed notably since the 2000s, setting a pattern for the current innovation capability assessment models. One of the first authors to propose this type of model was Chiesa et al. (1996), who proposes an evaluation according to maturity degree in 7 internal innovation practices. In 2006 Adams et al. (2006) carried out a bibliographic study of the different innovation capability assessment models, identifying 7 groups of the most representative and recurrent practices. Another widely cited innovation indicator is the potential innovation index (PII) proposed by the ERPI research team at the University of Lorraine (Boly et al., 2014, 2000; Rejeb et al., 2008). This index is based on a multicriteria model evaluating six major innovation practices through maturity grids, so companies can be classified into 4 categories according to their maturity level in: creativity, design and design, human resources, strategy, project management and knowledge capitalization.

This variety of models has enabled to establish common characteristics in assessment models, among which the focus on evaluating internal processes or practices and multicriteria methods structure. However, there are notable differences between the assessment models, mainly in the group of practices considered and their relative importance for the overall evaluation. These differences are explained by the application context of studies, since, according to the sector of activity, cultural and economic context, the practices that characterize the innovation capabilities of companies could change.

2.2 Regional context and Innovation metrics

The work context of companies determines their performance profile in different internal innovation practices. According to the technological intensity, the regulatory changes, the number of competitors, the type of products, among other factors, companies must adapt their internal routines to be competitive in the industry. This means that a model for assessing innovation capability has to be adapted to application context in order to correctly characterize and measure this capability in the companies under study. Galvez et al., (2013) propose a benchmarking between SMEs from traditional sectors of activity in Argentina and France. This study used the PII indicator as a framework,

showing as a result that in the overall innovation performance there are not too many differences, that is, both Argentine and French companies have a similar index. However, when studying the profile by practice there are notorious differences, French companies have on average 45% more performance in the practices associated with strategy, while Argentinian companies are better by 23% in project management and in 14% in design practices.

In another study based on the PII, Haddad et al. (2014) interviewed innovation experts in Chile and France determining the importance of different practices to characterize the global innovation potential of SMEs. Chilean experts pondered more on design and human resources practices, while for French experts, project management and knowledge management practices were more important. In both studies, the differences can be explained as European companies have a greater tendency to reinforce planning and therefore the strategy, while in Latin America there is a tendency to develop the operational activities.

These studies show that for the proper use of an assessment innovation capability model we must consider an adaptation to the context to which the companies under study belong.

3. METHODOLOGY

Figure 1, shows the followed research methodology. It encompasses four main stages:

Contextual analysis: this stage needs a comprehensive data gathering and analysis of the national and regional innovation policies, the constitution and dynamics of the local economy. Considering the specific sector the characteristics of the industrial ecosystem must be highlighted.

Candidate practices: whereas there is a standard set of practices that characterizes the innovation dynamics of the firms, depending on the targeted sector, some adjustments could be provided for local analysis purposes. In this case two different ways exist. (1) adding particular practices to be analyzed further regarding a local requirement; (2) setting the importance degree of practices to fit the local characteristics.

Survey deployment: before applying the assessment, individual interviews of candidate participants must be accomplished to verify the right comprehension of the questions, language and used terms within the context of the application.

Data validation and analysis: once the survey is applied individual analysis but also collective statistical analysis must be realized highlighting the developed and undeveloped practices of the set of the surveyed firms. Also synergistic effects and potential improvement plans may be determined.

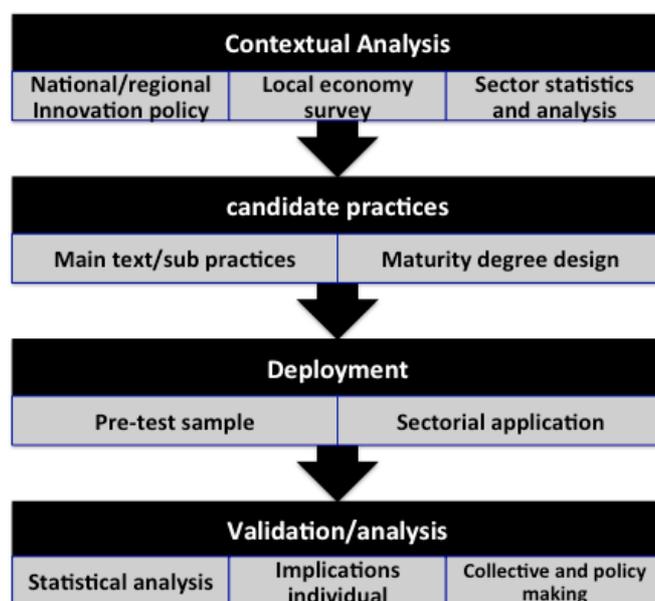


Figure 1 methodological approach

4. CASE STUDY: INNOVATION CAPABILITIES OF WINE SME's IN SAN JUAN

4.1 Context of the study

San Juan is one of the twenty-three provinces that compose the Argentinian Republic. The territory of this province has 89 651 Km², dominated by a mountainous relief interspersed by valleys and crossings under a climate, predominantly, temperate dry, with a marked shortage of superficial water courses. In the valleys, oases are present, where the agricultural activity is mainly viticulture, activity that typifies the province. It is an economic activity of outstanding importance and tradition due to the characteristics of its soil and climate, which allow obtaining products of recognized quality. It covers an area of 47 400 ha., of which 62% has wine grapes and 28% table varieties. The most important varieties of vinification are Syrah, Malbec, Cabernet Sauvignon, Bonarda, Torrontés and Cherry. Around 2.38 million hectoliters are produced annually, of which 52% correspond to white wines, 44% to red wines, and 4% to rosé wines. 34% of wines that are considered high-quality wine.

The industrial sector is made up of wineries that manufacture wine, and those that also bottle, export, or sell to the domestic market. In 2015, according to data from the National Institute of Viticulture (INV), there were about 130 wineries that produced wine in the province, while those that fractioned wine were 120 (either for internal market or for export). Argentina being the sixth world producer of wines, San Juan contributes with 20% of production (CFI 2016).

With the objective of evaluating the innovation capabilities in the productive chain of grapes and wines in the province of San Juan, a study was conducted with a sample of 8 firms of different sizes (Table 1). Two large companies (e7 and e8) have been included in order to evaluate the behavior of the PII with companies that generally show a better performance than an SME to validate the higher evaluation levels in the maturity grid.

Table 1 Description of the firms that make part of this study

| Enterprise | Foundation Year | Size (number of employees) | Industrial Activity Description |
|------------|-----------------|----------------------------|---|
| E1 | 2001 | 1 to 4 | Craft aging red wine. Bonarda and Tannat varieties. Seasonal production of 3000 bottles. |
| E2 | 2002 | 5 to 9 | Craft of six different varieties. Full package tasting concept. With a hostel next to the winery at the foot of the mountains. |
| E3 | 1936 | 25 to 49 | Familiar winery crafting premium wines for the local and international market. |
| E4 | 2004 | 5 to 9 | Craft wine from their own crops big of 14 hectares. Production capacity of 70 000 bottles per year. |
| E5 | 1999 | 5 to 9 | Family owned winery, with diversified activities of craft food and wines. |
| E6 | | 10 to 24 | Craft production of dry grapes is a supplier for food retailers. |
| E7 | 1987 | 50 to 150 | Concentrated and rectified must (CRM). Certified HACCP, ISO 22000. |
| E8 | 1870 | 250 to 4999 | The company is the most recognized on wine production in Argentina. A multinational company. Production of more than 2 100 000 bottles of different brands and varieties. The company has its own museum open to guided visits. |

It was done by calculating the Potential Innovation Index (PII), for which the methodology described in (Galvez et al., 2013).

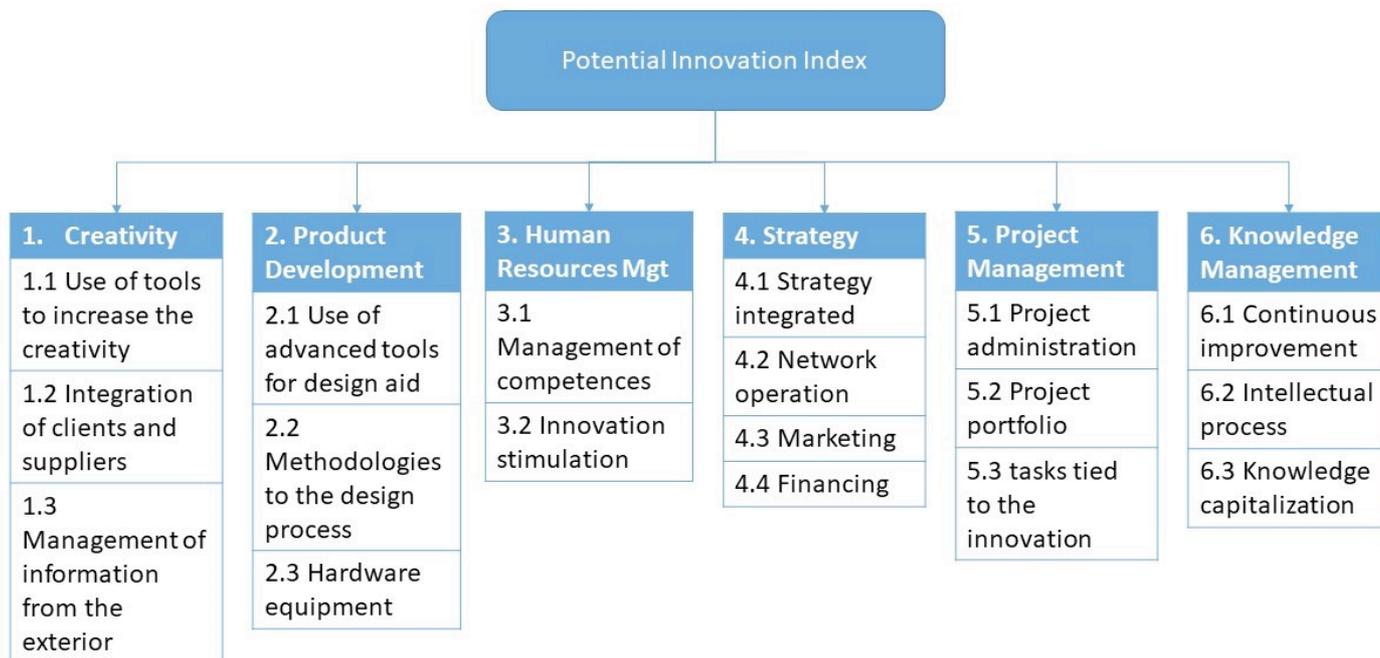


Figure 2. Potential Innovation Index structure (Galvez et al., 2013).

4.2 Method and tools

The PII methodology and framework were used through direct interviews with the company managers during the first semester 2017. Data were then processed using the *InnovationWay*® on-line assessment tool.¹

4.3 Results of the assessment

4.3.1. Innovation capabilities by firm

Table 2 shows the resulting firm’s innovation categories by firms:

Table 2 PII performance categories

| Firm | Category |
|------|-----------|
| E1 | Passive |
| E2 | Reactive |
| E3 | Reactive |
| E4 | Reactive |
| E5 | Preactive |
| E6 | Preactive |
| E7 | Proactive |
| E8 | Proactive |

Figure 3 Shows the PII performance profiles for the assessed firm (for the sake of clarity, only the set of 6 SMEs were included in the plot. In the following section these result will be discussed.

¹ <http://innovation-way.com>

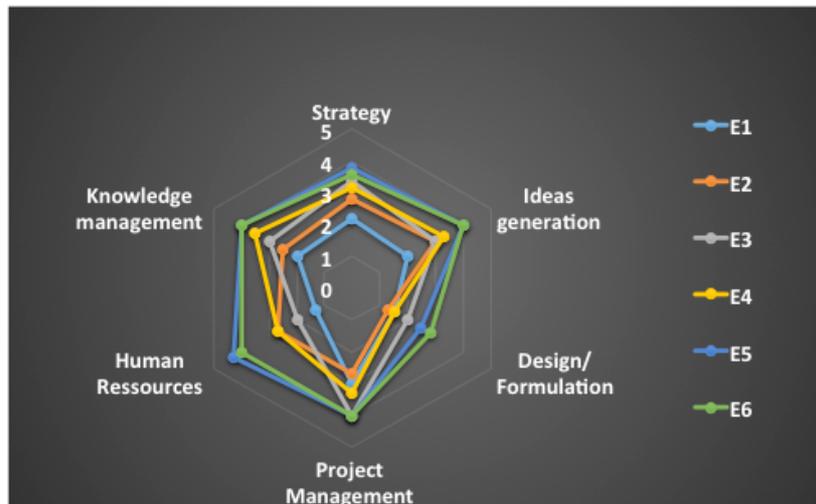


Figure 3 San Juan Region SMEs' Performance per innovative practice

Enterprise 1 (E1 is the smallest of all evaluated SMEs. Its limited resources constitute a great obstacle for many of the activities studied. However its strategy is based on survival and self-sustainability, therefore the result obtained from its Innovation Capacity, "PASSIVE" coincides with the strategy of the company.

In most practices, the organization has lower levels of performance than the rest of the SMEs. However, regarding the Project Management practice it has an intermediate (as the E2), being one of its strengths, thanks to its ability to distribute responsibilities and participation of experts in various issues.

The staff of the company is made up of the company's partners (an agronomist and an accountant) and the winemaker, they do not have more staff. Being a family-style company, with a marked division of responsibilities, it does not consider activities linked to "Human Resources," nor does it deal with "Knowledge Management". On despite its size, this company was taken into account in the sampling of this study, because it is representative of a large number of small companies in the area.

Firms 2, 3 and 4 (E2, E3 and E4) obtained the same performance category, "REACTIVE". E2 and E4 are smaller than E3, and also offer an extra service to the commercialization of wine. E2 has a guesthouse for tourists who want to discover the winery and spend a few days in the site, E4 is part of the "Wine Route" of the province and even, has a small museum for the visit of tourists. In the case of E3, in addition to marketing in the domestic market, it exports part of its production.

These enterprises have a good performance in practices related to "Generation of ideas" and "Knowledge management," where the three companies present the same or similar performance. They work with the creativity of the staff in those areas that need it most, such as marketing and marketing of the elaborated wines; they also regularly consult the preferences of their customers regarding product packaging, wine types (varietals), etc.

Regarding practices of "Project Management" and "Design and Formulation" the company E3 stands out a little more; has more dedicated staff, better structuration of the functional areas in the company, and a set of external experts who support the company in case of being subjected to great pressure from the market or face problems that must be solved immediately.

Enterprises E2 and E3 act and seek for creative ideas, in almost all the evaluated practices, whenever the client requests it or the situation in which they find themselves constrained. In comparison to E4, in spite of having scarce resources, is constantly seeking the continuous improvement of its processes and quality, gaining competitive advantage in this aspect.

Enterprises 5 and 6 (E5 and E6) entered into the category "PREACTIVE". Broadly speaking both have very good levels in most of the practices, especially in "Generation of ideas", "Project management", "Knowledge management",

and "Human Resources". E6 presents in very few activities a performance lower than 4, and for its answers it has future projects of improvement in many aspects of the company (quality control in the production of grapevines, mechanisms of irrigation, process of harvest and drying of the grape) .

These are very dynamic enterprises that are constantly looking for new ways to carry out their activities and processes, allowing to reduce times, increase efficiency and translate them into greater profitability. Within the evaluated SMEs, E6 is the one had accomplished the higher number of modifications and innovations within the company over time, together with E4 (belonging to a lower category). Not only did they manage to improve the level of technology, but also grape harvesting, transport and loading methodologies to nearby destinations, storage processes, etc.

E5 and E6 are carrying out regularly technology watch activities, which allow them to be at the level of their competitors and guide their improvement projects. For example, the E5 has the production facilities adapted for guided tours, they have a small restaurant, and a wine-tasting room. In addition, at the moment, it incorporated the production of raw ham that attracts the attention of the people and is a great complement for the vitivinicultural activity.

Regarding the performance obtained by firms 7 and 8 (E7 and E8), there are the two large companies analyzed, the category reached by them is "PROACTIVE." Assuming that these are expert companies in the field or in search of growth and constant updating, and with sufficient resources for this. Both of them claim that after important researches on the current state of the grape market, analysis of its customers, and competitors, they develop long-term projects where innovation is present in most aspects. Its activities of "Design and Formulation" have a very good performance in comparison with the studied SMEs. They are already certified with ISO 22000 standards, which are committed to the development of "Knowledge Management" activities. The working positions have descriptive cards, in the laboratories there are protocols that bus be accomplished with rigor. Also the client has a more active participation, as well as the suppliers. Communication within the company is based on a computer network system, so that the connection between the different areas is maximum, and meetings are daily habits that help to present problems, solutions and work on continuous improvement.

4.3.2. Performance of the San Juan area wine SME’s regarding innovation

In order to carry out a global analysis, regarding the behavior of the sector related to the innovation capabilities, an analysis following this of Galvez's proposal (Galvez, D. 2015), the averages of the values reached for each practice of the companies analyzed were calculated. Figure 4.

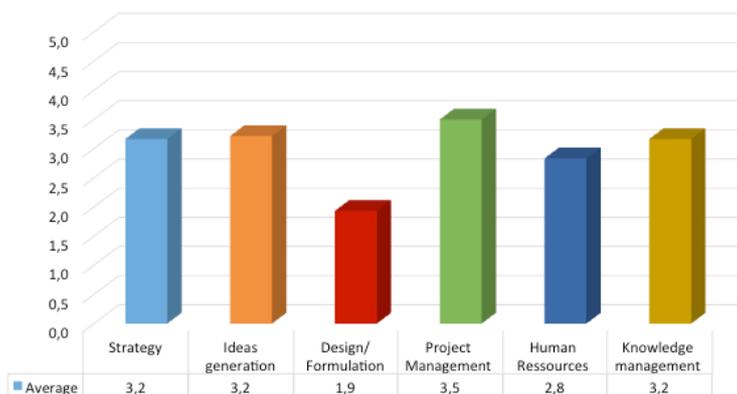


Figure 4 average performances of the wine sector’s SMEs

Moreover, Table 3 summarizes strengths and weaknesses of the sector after the direct interviews.

Table 1 Innovation strengths and weaknesses of the wine sector in San Juan

| Sector Features | Best Practices | Practices description | Example |
|---------------------|----------------------------|--|---|
| Strengths (motors) | Ideation capabilities | Although SMEs do not implement specific tools to stimulate creativity, they work as a team to search for innovative changes. In addition to finding creative solutions they try to do it, in most cases, with their own tools and resources, minimizing costs. | Subpractice "Internal generation of ideas". E4 to optimize the storage space of finished products and improve the storage process, developed a new storage system consisting of iron baskets. Subpractice "Integration of customers and suppliers". E3 to design the logos or packaging for the new varieties of wine elaborated, took into account the opinion of customers, friends or family. In this way suggestions for improvement or interesting modifications were obtained. |
| | Project Management | It is the practice where companies perform in a better way. | Subpractice: "Definition of phases and milestones". All companies in general divide their projects in clear stages, analysis of feasibility, monitoring and evaluation. Subpractice: "Roles and organization". In all cases, SMEs have great facilities to assign responsible to different projects or tasks, and distribute roles. |
| Weaknesses (Brakes) | Design / Formulaion | The five evaluated SME winemakers, had low performance within the practice of "Design and Formulation", either due to lack of resources, knowledge or nature of industrial activity. | Subpractices: "Technical resources for design" and "Methods for design / formulation". They are not known or applied. |
| | Human Resources Management | Although, it is a practice with low performance average, it has a high standard deviation of 1.15, therefore, there may be companies that differ significantly in this practice and achieve good performance in "Human Resources". | Subpractice "Communication on Innovation". Most of the firms do not implement communication tools to keep the whole firm's employees or staff informed about new projects from the outset. The information remains only in those directly involved. Subpractice "Learning and Competency Management". Companies E1 and E3 do not have descriptive cards of positions, evaluation of performance of employees, training of the same, etc. |

5. DISCUSSIONS AND CONCLUSION

Research about innovation capabilities assessment models have allowed to determine the basis on what practices and internal processes should be considered to characterize this capability in companies. Some practices are recurrent regardless of the company context. For example, strategy is a practice on which every company should work. However, there are a series of innovation processes and practices that are specific to each context. This characteristic must be considered when defining the innovation capabilities assessment models that will be used. In this work, a method of adaptation on the list of practices evaluated and also on the maturity grid of each practice was proposed. Since depending on the context, the global practice can be maintained, but the way of developing it can vary, therefore, in that case only the maturity grid should be adapted.

This work highlights the need to consider certain particularities of the environment in order to properly manage the innovation capability of companies. This adaptation must be done with relevant actors familiar

with the sector who help to correctly contextualize the innovation capabilities assessment model. Based on this information, the model can be adapted by modifying the practices description and their respective maturity grid, or it can be adapted by modifying the weight vector associated with practice importance to determine the global innovation potential of the company.

Acknowledgement :

Authors want to thank the InnovationWay team for their technical support during the realization of the present study.

References

- Adams, R., Bessant, J., et Phelps, R. (2006). Innovation management measurement: A review. *Int. J. Manag. Rev.* 8, 21–47.
- Boly, V., Morel, L., Assielou, N., Camargo, M., 2014. Evaluating innovative processes in french firms: Methodological proposition for firm innovation capacity evaluation. *Res. Policy* 43, 608–622.
- Boly, V., Morel, L., Renaud, J., Guidat, C., 2000. Innovation in low tech SMBs: evidence of a necessary constructivist approach. *Technovation* 20, 161–168.
- Chiesa, V., Coughlan, P., Voss, C.A., 1996. Development of a Technical Innovation Audit. *J. Prod. Innov. Manag.* 13, 105–136. <https://doi.org/10.1111/1540-5885.1320105>
- CFI (2016). Informe sectorial. Consejo Federal de Inversiones <http://biblioteca.cfi.org.ar/wp-content/uploads/sites/2/2016/03/sector-vinos2016.pdf>
- Galvez, D., Camargo, M., Rodriguez, J., Morel, L., 2013. PII- Potential Innovation Index: a Tool to Benchmark Innovation Capabilities in International Context. *J. Technol. Manag. Amp Innov.* 8, 36–45. <https://doi.org/10.4067/S0718-27242013000500004>
- Garcia, F.A., Marchetta, M.G., Camargo, M., Morel, L., Forradellas, R.Q., 2012. A framework for measuring logistics performance in the wine industry. *Int. J. Prod. Econ.* 135, 284–298. <https://doi.org/10.1016/j.ijpe.2011.08.003>
- Guan, J.C., Yam, R.C.M., Mok, C.K., Ma, N., 2006. A study of the relationship between competitiveness and technological innovation capability based on DEA models. *Eur. J. Oper. Res.* 170, 971–986.
- Haddad N. Galvez D. Wendling L., Alfaro M., Camargo M. Potential Innovation Index: Development of a protocol for the assignment of weights in MCDA. Conference Proceedings of the 23th International Conference on Management of Technology. Washington D.C., US. may 22-26, 2014
- James P., A., Knut, H., David L., M., Harold, S., et Andrew, T. (2008). *Measuring Innovation 2008: Squandered Opportunities*. A BCG Senior Management Survey.
- Milbergs, E., et Vonortas, D. (2004). *Innovation Metrics: Measurement To Insight*. Present. Natl. Innov. Initiat. 21st Century Work. Group Cent. Accel. Innov. George Wash. Univ.
- Nemery, P., Ishizaka, A., Camargo, M., Morel, L., 2012. Enriching descriptive information in ranking and sorting problems with visualizations techniques. *J. Model. Manag.* 7, 130–147. <https://doi.org/10.1108/17465661211242778>
- Rejeb, H.B., Morel-Guimarães, L., Boly, V., Assiélou, N.G., 2008. Measuring innovation best practices: Improvement of an innovation index integrating threshold and synergy effects. *Technovation* 28, 838–854. <https://doi.org/10.1016/j.technovation.2008.08.005>
- Sepulveda, J., Gonzalez, J., Camargo, M., Alfaro, M., 2010. A metrics-based diagnosis tool for enhancing innovation capabilities in SMEs. *Int. J. Comput. Commun. Control* 5, Pages 919-928.
- Wang, C., Lu, I., Chen, C., 2008. Evaluating firm technological innovation capability under uncertainty. *Technovation* 28, 349–363. <https://doi.org/10.1016/j.technovation.2007.10.007>
- Yam, R.C.M., Guan, J.C., Pun, K.F., Tang, E.P.Y., 2004. An audit of technological innovation capabilities in chinese firms: some empirical findings in Beijing, China. *Res. Policy* 33, 1123–1140. <https://doi.org/10.1016/j.respol.2004.05.004>